

Claims

1. A composition suitable for the preparation of a carbon-containing material including:
 - 5 (i) a binder phase including an optionally substituted phenolic resin;
 - (ii) synthetic mesophase carbon from aromatic hydrocarbons and;
 - (iii) inorganic filler particles suitable for use as refractory material for high temperature applications.
2. A composition is claimed in claim 1 wherein the phenolic resin is a phenol-aldehyde type resin.
- 10 3. A composition is claimed in claim 2 wherein the phenol-aldehyde type resin is a phenol-formaldehyde type resin.
4. 15 A composition as claimed in any one of claims 1 to 3 wherein the phenolic resin is selected from either resole or novolac and phenolic imide or phenolic polyamide or mixtures thereof.
5. 20 A composition as claimed in any one of claims 1 to 4 wherein the phenolic resin is substituted with alkyl or imide.
6. 25 A composition as claimed in claim 5 wherein the alkyl is methyl or t-butyl.
7. A composition as claimed in claim 5 wherein the imide is maleimide or succinimide.
8. 30 A composition as claimed in any one of claims 1 to 7 where the refractory material is one or more of non oxide refractory materials.
9. A composition as claimed in claim 8 wherein the non oxide refractory material is boride, carbide and/or nitride.
10. A composition as claimed in claim 9 wherein the boride is titanium diboride and/or zirconium diboride.
11. A composition as claimed in claim 9 wherein the carbide is silicon carbide or titanium carbide.
12. A composition as claimed in claim 9 wherein the nitride is silicon nitride or aluminium nitride.

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13. A composition as claimed in any one of claims 1 to 12 further comprising an additive selected from the group consisting of crosslinkers, polymerisation promoters, catalysts, soaps, wetting agents, accelerators, hardeners and/or sources of formaldehyde.

5 14. A composition as claimed in claim 13 wherein the crosslinker is hexamine (hexamethylene tetramine (HMTA)).

15. A composition as claimed in claim 13 wherein the source of formaldehyde is formalin, paraform or trioxane.

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10 16. A composition as defined in any one of claims 1 to 15 wherein the binder phase is selected from the group consisting of novolac-HMTA, novolac-furfuryl alcohol(FA)-HMTA, resole-novolac-HMTA, resole-carbon, resol-carbon-novolac-HMTA-FA, novolac-HMTA-FA carbon, novolac-HMTA-FA-carbon-TiB₂, resole-carbon-alumina-silica, carbon-TiB₂ resole, imidophenol-HMTA, poly(N-(hydroxyphenyl) maleimides)-HMTA or polyimide-novolac.

15 17. A composition as defined in claim 16 wherein the binder phase is novolac-FA-HMTA.

18. A composition as claimed in any one of claims 1 to 17 wherein the mesophase carbon is in the form of fibres, pellets, platelets or powder.

20 19. A composition as claimed in any one of claims 1 to 18 wherein the mesophase carbon is 100% anisotropic mesophase derived from naphthalene.

20. A composition as claimed in any one of claims 1 to 18 wherein the mesophase carbon is pre-treated by heating.

21. A composition as claimed in any one of claims 1 to 19 wherein the polymer or polymer composite and/or mesophase carbon are presented in the form of a solution.

25 22. A composition as claimed in claim 21 wherein the solvent used in the solution is inert or chemically reactive.

23. A composition as claimed in claim 22 wherein the solvent is incorporated in the polymer or polymer composite.

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30 24. A composition as claimed in claim 22 or claim 23 wherein the solvent is water or an organic solvent.

25. A composition as claimed in claim 24 wherein the organic solvent is an aromatic, ketone, alcohol, ester, ether or mixtures thereof.

26. ~~A composition as claimed in any one of claims 1 to 25 wherein other additives known in the polymer art are included in the polymer, polymer composite and/or synthetic mesophase carbon mixture.~~

27. A composition as claimed in any one of claims 21 to 26 wherein the mesophase carbon is combined with a solution of novolac/HMTA/FA.

28. A method for preparing a carbon-containing material including the steps of:

(a) mixing a binder phase containing an organic resin component or polymer composite with synthetic mesophase carbon and inorganic filler particles suitable for use as refractory material for high temperature applications;

(b) curing the mixture; and

(c) carbonising the cured mixture to above 800°C.

29. A method as claimed in claim 28 wherein the mixture of the binder phase and the mesophase carbon is cured at temperatures up to about 205°C under pressure.

30. ~~A method as claimed in claim 28 or 29 wherein the cured mixture is heated up to temperatures above about 800°C.~~

31. A method as claimed in claim 30 wherein the temperature is about 1000°C.

32. ~~An article which is wholly or partly manufactured from the carbon-containing material defined in any one of claims 1 to 32.~~

33. An article as claimed in claim 32 which is steel fabrication equipment or other engineering products.

34. An article as claimed in claim 33 wherein the steel fabrication equipment is slide gates or valves, tap hole blockers or blast furnace linings.

35. An article as claimed in claim 34 which is used as part of an electrode in the electrolytic production of metals.

36. An article as claimed in claim 35 wherein the metals are aluminium and/or magnesium.

37. ~~An article as claimed in claim 32 or 36 which is used as a refractory liner in furnaces used for high temperature processing of materials.~~

38. An article as claimed in claim 37 wherein the materials are ferrous and non ferrous metals, glasses and ceramics.

39. An article as claimed in claim 33 wherein the engineering product is thermal protection barriers, aerospace components or aircraft, satellite or space craft structures.